

## WHAT IS CLAIMED IS:

- 1           1.       A keypad layout with the keypad having a predetermined number of  
2       keys thereon, the layout comprising:
  - 3           a predetermined number of symbols formed by letter characters of an alphabet  
4       and which represent sounds of a language, the predetermined number of symbols  
5       being greater than the predetermined number of keys; and
  - 6           a predetermined number of basic characters including certain ones of the  
7       symbols preselected to cooperate to form other ones of the symbols, the  
8       predetermined number of basic characters being less than the predetermined number  
9       of keys on the keypad.
- 1           2.       The keypad layout of claim 1 wherein the keypad is on a small, hand-  
2       held electronic data entry device.
- 1           3.       The keypad layout of claim 1 wherein the keypad has the keys  
2       arranged in four rows by three columns with the keys including numerals associated  
3       therewith.
- 1           4.       The keypad layout of claim 1 wherein the language is Chinese and the  
2       alphabet is a Romanized Chinese phonetic alphabet, the symbols being separated into  
3       at least two groups depending on location within a syllable in the Chinese language,  
4       and the preselected basic characters are from one of the symbol groups.

1           5.       A hand-held electronic device having a keypad for inputting symbols  
2   of an alphabet on keys of the pad in a highly regular and efficient layout to optimize  
3   user familiarity in ease of use of the keypad and to minimize multiple word formation  
4   via predetermined sequences of key inputs, the hand-held electronic devices  
5   comprising:

6           a compact housing including a screen thereon for displaying words formed by  
7   the inputted symbols with the keys arranged in predetermined numbers of rows and  
8   columns on the housing;

9           a first group of symbols for forming a segment of a syllable, the first group  
10   symbols being in predetermined ordering relative to each other and having a  
11   predetermined top-down, column-based arrangement;

12          a second group of symbols larger in number than the first symbol group for  
13   forming another segment of a syllable and including preselected basic characters for  
14   reducing the number of second group symbols that need to appear on the keys of the  
15   housing.

1           6.       The hand-held electronic device of claim 5 wherein the preselected  
2   basic characters have a predetermined order that is intuitive to a native speaker of the  
3   syllables formed by the symbols, the predetermined order including single vowel  
4   character symbols of the basic characters followed by nasal sound characters of the  
5   basic characters.

1           7.       The hand-held electronic device of claim 5 wherein the preselected  
2   basic characters include a pair of double character compound symbols selected to  
3   minimize the key inputs required for forming syllables.

1           8.       The hand-held electronic device of claim 7 wherein the keys include  
2   four rows by three columns of keys, and the pair of double characters compound  
3   symbols are on separate keys in a row other than the bottom row of keys.

1           9.       The hand-held electronic device of claim 7 wherein the pair of double  
2   character compound symbols are on separate keys that do not include other of the  
3   preselected basic characters.

1           10.      The hand-held electronic device of claim 5 wherein the keys include  
2   four rows by three columns of keys, the preselected basic characters include a single  
3   character symbol, the character of which is an initial character of compound character  
4   symbols of the second group symbols, the compound character symbols appearing on  
5   all three keys in the bottom row to maximize use of the keys for the second group  
6   basic characters and symbols distributed thereon, and

7           a navigation key distinct from the symbol input keys of the keypad to allow a  
8   user to traverse to different portions of the screen.

1           11.     The hand-held electronic device of claim 5 wherein the keys include  
2     four rows by three columns of keys, the preselected basic characters include a single  
3     character and a pair of characters which do not appear independently on the keys and  
4     that are final characters of predetermined second group symbols which are formed by  
5     multiple characters and which appear on keys in the bottom two rows to maximize use  
6     of the keys for the second group symbols distributed thereon.

1           12.     The hand-held electronic device of claim 11 wherein the preselected  
2     basic characters include single vowel character symbols that appear on all three keys  
3     in each of the top two rows with the predetermined second group symbols in the  
4     bottom two rows being formed by combinations of the single characters of the single  
5     vowel character symbols and the final single character and pair of characters and  
6     being in the same column and offset by one row from the key in the upper two rows  
7     having the single vowel character thereon that is a component thereof.

1           13.     The hand-held electronic device of claim 5 wherein the housing is one  
2     of a cell phone, a wireless messaging communicator, a memo-writer and a personal  
3     digital assistant.

1           14.     A highly regular and efficient layout of symbols of an alphabet, the  
2     symbols including one or more characters on a keypad to optimize user familiarity in  
3     ease of use of the keypad and to minimize multiple word formation via predetermined  
4     sequences of key inputs, the keypad layout comprising:

5           a plurality of keys that are in predetermined numbers of rows and columns for  
6     inputting the symbols; and

7           predetermined symbol groups with predetermined numbers of symbols where  
8     symbols from different symbol groups cooperate to form syllables;

9           a first one of the symbol groups having commonly known sets of symbols in a  
10    predetermined ordering, the symbols of the first symbol group arranged on keys in  
11    predetermined columns so that the order of the symbols generally corresponds to the  
12    row of the keys in which the characters lie;

13          a second one of the symbol groups which is reduced from the predetermined  
14    number thereof to basic characters including certain second group symbols for being  
15    arranged on the keys, the basic characters cooperating to form the remaining second  
16    group symbols for minimizing concentration of the symbols of the second group on  
17    the keys.

1           15.     The keypad layout of claim 14 wherein the second symbol group  
2 comprises symbols representing vowels or combinations of vowels and nasal sounds,  
3 the certain second group symbols of the basic characters comprise a predetermined  
4 number of single vowel character symbols, and the basic characters further comprise  
5 characters representing predetermined nasal sound; and

6           a predetermined ordered row-based arrangement of the basic characters that is  
7 intuitive to a native speaker of the syllables formed by the symbols with the single  
8 vowel character symbols preceding the predetermined nasal sound characters.

1           16.     The keypad layout of claim 15 wherein the plurality of keys include  
2 twelve keys arranged in four rows by three columns, and the predetermined number of  
3 single vowel character symbols are split into two ordered sets, the nasal sound  
4 characters form a third set with the first ordered set being in the first row of keys, the  
5 second ordered set being in the second row of keys, and the third set being in the third  
6 row of keys.

1           17.     The keypad layout of claim 14 wherein the plurality of keys on which  
2 the symbols appear include twelve keys arranged in four rows by three columns with  
3 the first group symbols appearing in each of the rows whereas the basic characters  
4 that cooperate to form the second group symbols appear only in the first three rows.

1           18.     The keypad layout of claim 14 wherein the arrangement of the first  
2 group symbols and the basic characters for forming the second group symbols on the  
3 keys is such that no more than four key inputs are required to form syllables and no  
4 more that three valid syllables that are commonly used can be formed.

1            19.    The keypad layout of claim 14 wherein the arrangement of the first  
2    group symbols and the basic characters for forming the second group symbols  
3    includes no more than two first group symbols or second group basic characters being  
4    on any one key.

1            20.    The keypad layout of claim 14 wherein the arrangement of the second  
2    group basic characters includes no more than one of the basic characters on any one  
3    key.

1            21.    The keypad layout of claim 14 wherein the first symbol group is a  
2    group of syllable initial symbols and the second symbol group is a group of syllable  
3    final symbols, and the symbol groups further comprising a group of syllable semi-  
4    initial symbols and a group of independent symbols with the semi-initial and  
5    independent symbols arranged together on a single lower row, intermediate column  
6    key.

1            22.    The keypad layout of claim 14 wherein the alphabet is a Chinese  
2    phonetic alphabet so that syllables formed by the symbols in the groups cooperate to  
3    form syllables phonetically, the first and second groups being a group of syllable  
4    initial and final symbols, respectively, with the certain second group symbols of the  
5    second group basic characters comprising single characters: A, O, E, I, U, and V,  
6    which represent vowel sounds.

1            23.    The keypad layout of claim 22 wherein the remaining second group  
2    basic characters comprise: N and NG, which represent nasal sounds.

1           24.     The keypad layout of claim 23 wherein the certain second group  
2     symbols include IA and UA.

1           25.     The keypad layout of claim 23 wherein the certain second group  
2     symbols include: AO, AI, AN and ANG for maximizing use of the keys for the  
3     second group basic characters.

1           26.     The keypad layout of claim 22 wherein the certain second group  
2     symbols include: AN, ANG, ONG, EN, ENG, IN, ING and UN for maximizing use of  
3     the keys for the second group basic characters.

1           27.     The keypad layout of claim 14 wherein the plurality of keys on which  
2     the symbols appear include twelve keys arranged in four rows by three columns with  
3     the arrangement of the second group basic characters being in a predetermined vowel-  
4     based pattern with character key placement in the first row generally corresponding to  
5     that in the third row and character key placement in the second row generally  
6     corresponding to that in the fourth row to maximize the regularity of the second group  
7     characters on the keypad for ease of use thereof.